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THE VALUE CREATION RADAR APPLIED TO THE SPACE ENGINEERING SECTOR: THE CASE OF DEIMOS ENGENHARIA

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The Value Creation Radar applied to the Space Engineering Sector: The Case of Deimos Engenharia

Abstract

This case study illustrates the application of the Value Creation Radar (VCR) to SenSyF, an Earth Observation (EO) system which was developed by Deimos Engenharia S.A. (DME), the Portuguese affiliate of Elecnor Deimos. It describes how a team of consultants adopted the VCR in order to find new market applications for SenSyF, selected the one with the highest potential, and defined a path to guarantee a sustainable market launch. This case study highlights the main challenges of bringing a technology-driven company closer to the market in the pursuit of long-term sustainability, while not compromising its technological capabilities.

Keywords: Value Creation Radar, Innovation Management, VCR's Paradox: Market vs Technology, Space Engineering, Funds for Science

The Value Creation Radar applied to the Space Engineering Sector: The Case of Deimos Engenharia

On August 2015, Paulo Bessa, a senior manager at Edison Strategy Partners (ESP), was arriving to his office in Lisbon to start a new project. He noticed that an urgent message from an ESP Partner was lying on his desk with the name Nuno Catarino and a contact. After some minutes on the phone, Bessa realized that his team could apply the Value Creation Radar (VCR) for a challenging project on a sector he never would expect to work. Few hours later, he met his team to introduce the new assignment - "From September on, we will bring Deimos Engenharia (DME) from the space to the marketplace", he said.

Background

From Elecnor Deimos to Deimos Engenharia

Elecnor Deimos, is a Spanish group established in 2002 by 20 highly qualified space enthusiasts with the objective of developing breakthrough space engineering solutions for the European market. In 2015, ED employs more than 500 people[i]. In 2000, Portugal has joined the European Space Agency (ESA), the organization in charge of the design and implementation of European space projects. As ESA's budget comes directly from its member states, it only funds projects from companies located in these countries[ii]. In order to exploit the emerging business opportunities for the undeveloped Portuguese space sector, Elecnor Deimos decided to found in 2001 Deimos Engenharia S.A (DME). Soon, DME obtained recognition in the European space landscape for delivering valuable space applications, satellite consulting and control station projects. DME is split into three divisions - GNSS Systems, Flight System and Ground Systems. Its key customers are the ESA and EUMETSAT, and the most of DME's projects are co-funded by the European Commission (EC) through schemes such as H2020.

A new European trend

Few days before hiring ESP, Catarino, head of the Satellite Ground Systems section at DME, reflected about the future of his division. He was concerned about the new H2020 evaluation criteria, under which research projects that meet European or global market needs had higher chances to get funded[iii] (see **Exhibit 1** for H2020 criteria). He knew DME had no market orientation and feared the rules for other funding schemes could follow the same trend.

On July's board meeting, Catarino shared his thoughts with DME's managers (see **Exhibit 2** for the composition of DME's Board of Directors). In his perspective, DME's dependence on public funding for the creation of services, the two consecutive years in the red – 2011 and 2012 –, and consequent reduction in labour force were hinting the need to reshape DME's strategy (see **Exhibit 3** for net profits). Yet, as space research typically required high investment and unclear returns, they felt DME's activities for building new services needed to continue to be co-funded by public entities. Hence, the directors believed that DME had no alternative than adapting to the new conjecture. But how?

The board eventually agreed that thereafter the firm would conduct research in order to evaluate the market potential of its future projects. However, for the last 13 years, DME had always positioned itself mainly as a research entity, which did not require the firm to hire people with an orientation towards a market. To test a different approach, while avoiding the risk of hiring a whole new department, the board decided to hire ESP. ESP would be appointed to exploit DME's existing technical knowledge and bring it to a market. For this 4-month innovation management project, ESP would have a consulting team, composed by a partner, a senior manager, a manager, an analyst, and an external innovation advisor responsible for the creation of the VCR. The final goal was to scan the market potential of one of DME's technology, select the market application with the highest potential and prepare an implementation plan.

The kick-off meeting

On the 1st of September, ESP team met Catarino and Nuno Grosso, a DME Project Engineer. Catarino told that his team was appointed to define a market application for SenSyF, a €2.5m EO technology from which nearly 75% was funded by the EC, under the FP7 Research Programme[iv]. When the external advisor asked the team what the technology was about, Catarino and Grosso delivered a very technical explanation which could not be followed by the consultants. When Bessa, the innovation analyst, asked "But who is your target?", Catarino started to unfold the real problem – despite SenSyF's huge variety of potential customers, DME had always targeted all at once. Moreover, SenSyF surely needed to be tailored to satisfy the needs of a well-defined target. At his point, the consultants could identify that the company was facing the Paradox of Choice[v]. Furthermore, the time and resource constraints to select the next project required the consultants to be very methodical.

The team realized that no methodology was more suitable for the case than the Value Creation Radar (VCR). This innovation management tool was especially suitable for companies with a focus on the technology, which frequently failed to deliver value-adding outputs**.** While being a "flexible Stage-Gate" process, the VCR is very dynamic. During its 5 stages there are constant internal and external validations that reshape and improve the past conclusions. The 5 stages are divided in the 12 Is of Innovation, which are not described in this case study due to space limitations, but were applied (see **Exhibit 4** for the Value Creation Radar). Overall, the VCR purposed a unique method to address DME'S problem. It required the input of experts from different backgrounds in order to find a relevant target market for SenSyF.

Stage 1 of VCR – Discover Value

The first stage of the VCR was Discover Value. It is meant to clarify the context in which DME operates, learn how SenSyF works and acknowledge its key attributes.

The context - Earth Observation

According to Elsa Alexandrino, DME's Business Development Manager, the European market for EO is purely institutional as the ESA fund and the EC subsidizes a large share of the research initiatives[vi]. Similarly to what happened with navigation and telecommunication satellites in the past – firstly thought for the military and then exploited by the masses - the EC defended that EO satellite data could change the European citizens' life. With the access of EO data, programmers could develop services for various strategic fields such as environmental protection, water transport, land monitoring or agriculture. In 1998, the EC created Copernicus - The European EO Programme[vii]. The scheme was intended to democratize the EO data access along the upstream and midstream sections of the EO value chain (see **Exhibit 5** for the EO value chain). With a €3.8b budget for the period 2014-2020, the EC expected to launch a constellation of 11 EO satellites under 7 Sentinel missions until 2026[viii, ix].

An EC request – SenSyF

To understand SenSyF's role in the EO landscape, the consultants interviewed Nuno Almeida, a project manager who worked on SenSyF as a mediator between DME and Copernicus. According to him, SenSyF is meant to support EO programmers to overcome the main difficulties they were facing while working with EO data. In his opinion, it was difficult to gather the right data because each satellite was sending its data to different data centres with a wide variety of set-ups and difficult access channels. This prevented programmers to even develop simple applications, which typically require inputs from more than one satellite. Moreover, they were struggling to process the inputs as the data flows are huge – for instance, EC's satellite Sentinel 1A sends about 2.5 terabytes of raw data per day all alone[x].

The team also took a chance to learn more about the SenSyF. It is a software development platform designed by DME and a consortium of eight partners from 2012 to 2015[xi]. It allows programmers to create applications in common programming languages such as C++, Python,

MatLab, or Java. Furthermore, it reduces the effort to obtain EO data by automatically gathering data from Sentinel satellites. Besides, SenSyF is connected to Terradue's computer cloud system which provides fully flexible processing and storage power by using public cloud infrastructures. This latter feature allows users to rent only exactly the needed resources whilst saving infrastructure costs.

At this point, the consultants also interviewed a couple of the software developers and Bessa was finally able to describe how SenSyF works - "A programmer computes an algorithm on the SenSyF and selects data according to geographic and time variables. Then, this platform runs the algorithm on the data through the cloud resources and gives back the output", he said. Overall, SenSyF reduced the time to market for EO value adding services and offered limitless and affordable scalability (see **Exhibit 7** for a scheme with the functioning of SenSyF).

Despite perceiving the SenSyF's value, the team could not realize what was missing to reach the market. Luckily, Bessa met Catarino at the elevator, who clarified that "To create an algorithm, programmers need not only SenSyF but also a set of specific tools for their area of interest. No individual will build these tools to develop one single application". Bessa understood that the company had no scale to launch a complete set of final adding EO based services within one area. Instead, the company would provide programmers with tools so that they could deliver their own ideas in the form of services. Since SenSyF did not satisfy a target market, the team defined SenSyF as an invention rather than an innovation.

Stage 2 of VCR – Create Value

The second stage of the VCR consisted in finding potential market applications for SenSyF. Hence, during this stage, primary and secondary data were collected.

Macro and competition research

According to research, the increasing democratic access to EO inputs was triggering a demand expansion both for raw data and for EO-based value-adding services[xii]. The European commercial EO data sales were €220m in 2013 and was expected to grow to €410m by 2023. The majority of the demand comes from the military industry - the only mature segment - which claims nearly 70% of the overall market[xiii]. The world demand in the midstream and downstream sections of the value chain was likely to more than duplicate until 2021[xiv]. The team could also identify the five most important downstream markets at the European level in 2011 – Agriculture (€35m), Oil and Natural Gas Exploitation (€24m), Water transport (€24m), Non-life Insurance (€14m) and Renewable Energies (€10m)[xv].

According to DME's internal reports, CloudEO, EODC, DigitalGlobe and TEP were SenSyF's main competitors. Since CloudEO and EODC operated as EO data and applications' brokers, the consultants did not perceive these as rivals. Yet, they perceived DigitalGlobe and TEP as true competitors. DigitalGlobe was an American company which had its 3-satellite constellation and EO-based services in areas such as Energy, Defence, Mining and Intelligence. Despite not offering a software development framework, DME's stakeholders perceived that the DigitalGlobe's knowledge experience across the value chain provided the company with the capability of developing a platform like SenSyF in the future. The consultants also found that ESA's TEP are a set of thematic software development frameworks to support research in five areas: hydrology, urban, polar, forestry and coastal environment[xvi]. However, the first TEP, for hydrology, only started to be built in 2015 and ESA's intentions were not clear at the time.

Just before finishing the analysis, an ESA researcher informed Bessa that Google was on the move for EO data exploitation with its Earth Engine (GEE). GEE is a demonstration service which allows developers to run their algorithms and obtain experimental outputs. Despite GEE had huge limitations in the data access and processing, Google's capacity to invest worried

Catarino, who defended "Even if a company has no knowledge in EO, money will attract the best engineers in business".

Prospect users' feedback

After gathering secondary data, it was necessary to complement it with the user perspective. To obtain diverse and unbiased opinions, he interviewed seven potential customers who had no past collaboration with DME[xvii]. For these meetings, three objectives were set: introduce the service; track for unidentified SenSyF's advantages and weaknesses; and measure interviewees' interest on the service. The feedback was generally positive and some of the participants came up with new ideas for SenSyF.

Two interviewees were so interested in the technology that were interested in developing new projects with DME. The first was a one-year project during which DME should create an application to measure the subsidence of European dams' surroundings. The second was a two-year contract meant to build a coastal monitoring service. From the feedback the consultants got within the company, DME could easily complete the projects by simply allocating the personnel who had just finished SenSyF's development. The risk of failing was minimum.

Finding potential market applications

When the team finished the process of gathering primary and secondary data, they had already some market applications in mind. These derived either from a market-pull or from a technology-push perspective. Under the market-pull, the consultants thought about the customer needs that could SenSyF satisfy in the future. For the technology-push, the team departed from the technology attributes address a given a market need.

From past research, internal documents and interviews, the consultants found the first 33 ideas. Yet, they wanted to deliver a more robust set of options. Hence, they decided to ask help from a university professor. Fortunately, the external innovation advisor was delivering an innovation management course for 18 PhD students from various backgrounds. On the 28th

October, the students were learning about technology transfer and the team was invited to visit the class. Bessa provided a 25 minute presentation to present SenSyF. Then, the consultants had a unique opportunity to engage on a brainstorm with the students to find potential market applications. The PhD students were requested to think how SenSyF could be useful for their professional or personal lives. Groups of three students were set and, as they built ideas, the consultants went through the teams to provide support.

Stage 3 of VCR – Validate Value

After concluding Stage 2 of the VCR, the team gathered 54 potential applications. As the work advanced greatly in the previous weeks, the consultants decided to appoint a major project validation with the SenSyF Stakeholders. Despite some applications had potential, Almeida, Catarino and Grosso pointed out that most of the applications were targeted for the downstream market. Instead, they restated that DME should build a set of tools for programmers who could create their own final services within specific areas.

While understanding the perspective of the stakeholders, Bessa argued that downstream applications were useful to estimate the potential market of midstream solutions – "If there is a market for downstream applications from a specific area, for sure there will be programmers willing to create these.", he said. Despite understanding that different possible midstream applications could be useful to create some of the final services that consultants presented, the team had no idea how they could aggregate these. To overcome the situation, the team relied on VCR's paradox, that technology and market are often opposing forces which complement each other. However, neither the market side nor the technology side have all the answers alone. So, the team asked the stakeholders for help and it was a success. In less than 1 hour, the SenSyF stakeholders aggregated the 54 market applications into 15 midstream applications and discussed its initial technological feasibility.

Stage 4 of VCR – Capture Value

Feeling the team had already a large set of applications, Bessa decided it was time to choose the most important filters to select the final market application. Filters are criteria that help managers to select the best applications in a methodical way. To begin the process, the consultants gathered 63 potential filters which were used for past projects at ESP. From these, only 20 were considered to be relevant for SenSyF. Knowing that sometimes the best insights are unexpectedly revealed, the team listened the records of all previous interviews and meetings, from which they found 12 new filters. In the meantime, the external innovation advisor invited the consultants to attend a Bio-Entrepreneurship class on the 29th October to show the ongoing work for 42 PhD candidates. On that day, the consultants asked the students to think about 3 filters that could select SenSyF's best application.

At the end of the whole process, the consultants were able to find 49 potential filters within three areas – Funding, Market and Macro Trends and Technology, Team and Company. To validate the filters, the consultants asked SenSyF stakeholders to apply the Poker Methodology[xviii] to the filters, from which 40 lasted (see **Exhibit 7** for the filters). At this point, the consultants rejected 16 filters that were considered to be impossible to measure given the timeframe and company resources. Then, Bessa sent to the previously mentioned stakeholders a survey asking them to select the 6 most relevant filters to choose SenSyF's future market application. The answers were summarized on an Excel spreadsheet and different weights were attributed accordingly to the position of each stakeholder within DME's structure. At this point, the Excel spreadsheet looked beautiful – the 6 final filters had been defined.

As the pool of applications and the final filters were defined, the team created a Value Creation Funnel (see **Exhibit 8** for the funnel). The best application, which passed through all the filters, was SenSyFLand. Besides SenSyF's key attributes, SenSyFLand offered a set of data processing tools which allows the development of EO-based applications within 3 main

areas – Agriculture, Land Cover and Coastal and Inland Waters (see **Exhibit 9** for examples of value adding services which can be built with SenSyFLand). Having in mind that it is impossible to communicate with multiple targets at once, DME should focus in one community.

Finding identity with a Positioning Statement

SenSyFLand's potential customers were software developers, split into two segments – universities and private companies. Both these segments could be subdivided agriculture, land and coastal and inland waters. On the one hand, private companies had a higher purchasing power and a more market-oriented perspective than students. Though, some private companies would not be willing to pay for these types of solutions, as these had already built their own ones. On the other hand, universities lacked funds to support SenSyFLand. However, researchers were eager to try an immature service and could be willing to support SenSyFLand's improvement if allowed to exploit its resources at an affordable price.

Deciding on the target market was one of the biggest challenges the team faced. After brainstorming with SenSyF stakeholders, one thing was clear – only private companies could turn SenSyFLand sustainable in the long-run. But to get there, DME needed to create engagement with the students that in the future would be willing to ask their companies to buy SenSyFLand's licence. The stakeholders eventually decided to target universities at a first stage until the service reaches a mature level of development and acquire a strong customer base. According to the market analysis, DME should communicate with developers of EO agricultural services (see **Exhibit 10** for the target funnels). To conclude this stage, the team purposed a positioning statement - "For developers of EO based agricultural applications, SenSyFLand stands out of the competition because it is the very first service that combines direct access to Sentinel satellite data, unlimited computing power, a generic development framework and a specialized software development toolkit for agriculture." These technical attributes are valuable for any programmer as this unique service allows them build their own

EO based applications with nothing more than a simple computer with internet access and no need for infrastructure or to build new tools.

Stage 5 of VCR – Consolidate Value

In the last stage of the VCR, Bessa's team designed a strategy to assure SenSyFLand's sustainable launch. To do so, they idealized a business model which complied with the service attributes, market conditions and company conjecture. It consisted in offering two license plans. The "Student-License", at a reduced price for universities that are willing to build either tools ordered by DME or final services while sharing its revenues with DME. In the future, the "Professional-Licence", which would offer SenSyFLand with continuous support and full infrastructure flexibility. Since there is no educated market for this service, direct selling is crucial for customer relationship management, building engagement and success. Despite the cost and revenue structures were clear, the consultants realized that further research should be conducted in order to estimate these (see **Exhibit 11** for the business model canvas).

Bessa understood that besides the future business model, the consultants should also propose a path to get there. Therefore, the 3M – Money, Men and Minute Framework[xix] was followed. Starting with Money, Bessa realized that in order to carry revenue and cost estimates, DME should also study how large was the customer base and what their willingness to pay is. The revenue would come from licence fees and from part of the final service sales in the case of being developed under the "Student-Licence". The team perceived that infrastructure, personnel and marketing as the most relevant costs. For Men, the company defined six major stakeholder profiles – a product coordinator, internal programmers, external programmers, a salesperson and a marketer. After inquiring SenSyF's stakeholders, the Minute has also been planned. The team estimated that 4 months would be enough to plan which tools to develop, conduct market research and forecast potential cash streams. In 2017, the beta service would be

available for researchers. With continuous development and collaboration, a mature service could be made available for companies in 2018 (see **Exhibit 12** for the 3 M framework).

A tough decision

On the 3rd of December, the Board of Directors met to approve the business plan for 2016. Due to the fact that a new project had to be assigned for the SenSyF team, the respective members were also present in the discussion.

At the beginning of the meeting, the consultants were invited to present their main findings. Despite consistently perceiving SenSyFLand as a valuable and robust concept, the participants seemed not to agree whether DME should develop it or not. To trigger discussion, Bessa asked if DME was eager to implement their recommendations. Almeida kicked-off by saying that "So far, we have been driven by research rather than by a customer. We must go ahead and test SenSyFLand in the real world". Catarino observed that SenSyFLand could bring a new and important revenue stream for the company. Despite agreeing with a strategy shift, Nuno Ávila, DME's General Manager, was quite more conservative - "Shouldn't we get to know our early adopters before taking a decision?" - he asked.

Contrary to others, the remaining SenSyF stakeholders would prefer to accept both projects DME has been offered during the consultants' round of interviews. In their opinion, both the two-year project for the development of a coastal monitoring service and the one-year assignment respecting to the measurement of the of European dams surroundings' subsidence could provide a safer revenue in 2016. Moreover, these were technologically feasible and would not require DME to hire employees.

Everyone could feel the tension in the room. The cards were on the table and it was clear that there were valid arguments in favour of both perspectives. What should the board decide?

Exhibits

Exhibit 1 – H2020 Evaluation Criteria for Research and Innovation Actions (RIA)[xx]

Note: DME's main points of concern are underlined.

1 - Excellence - The extent that the proposed work corresponds to the topic description in the work programme.

- Clarity and pertinence of the objectives;
- Credibility of the purposed approach;
- Soundness of the concept, including trans-disciplinary considerations, where relevant;
- Extent that proposed work is ambitious, has innovation potential, and is beyond the state of the art.

2- Impact – The extent to which the outputs of the project should contribute at the European and/or International level to:

- The expected impacts listed in
- the work programme under the relevant topic
- Enhancing innovation capacity and integration of new knowledge;
- Strengthening the competitiveness and growth of companies by developing innovations meeting the needs of European and global markets; and, where relevant, by delivering such innovations to the markets;
- Any other environmental and socially important impacts (not covered above);
- Effectiveness of the proposed measures to exploit and disseminate the project results, to communicate the project, and to manage research data where relevant.

3 - Quality and efficiency of the implementation - The following aspects will be taken into account:

- Coherence and effectiveness of the work plan, including appropriateness of the allocation of tasks and resources;
- Complementarity of the participants within the consortium (when relevant);
- Appropriateness of the management structures and procedures, including risk and innovation management.

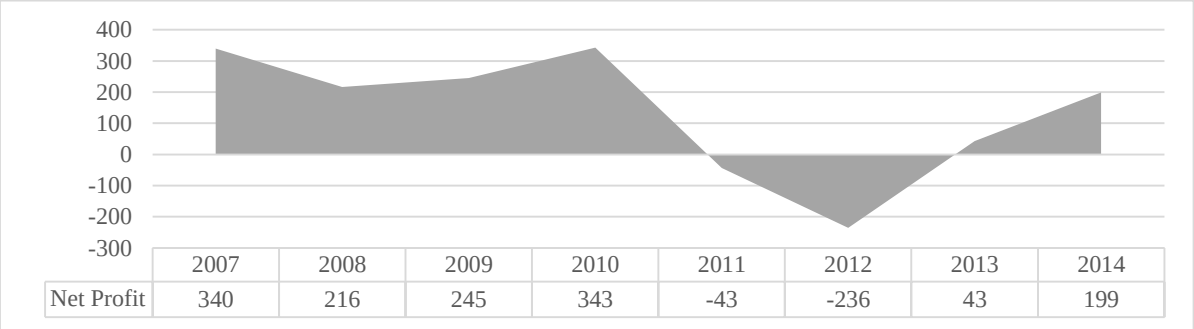
Source: European Commission

Exhibit 2 – Composition of DME's board of directors

Position	Name
CEO group Deimos	Miguel Bello
DME's General Manager	Nuno Ávila
DME's Business Development Manager	Elsa Alexandrino
Head of the GNSS Systems & Flight Systems Divisions	Pedro Silva
Head of the Ground Systems Division	Antonio Gutierrez
Head of the Payload Data Ground Systems Business Unit	Nuno Catarino

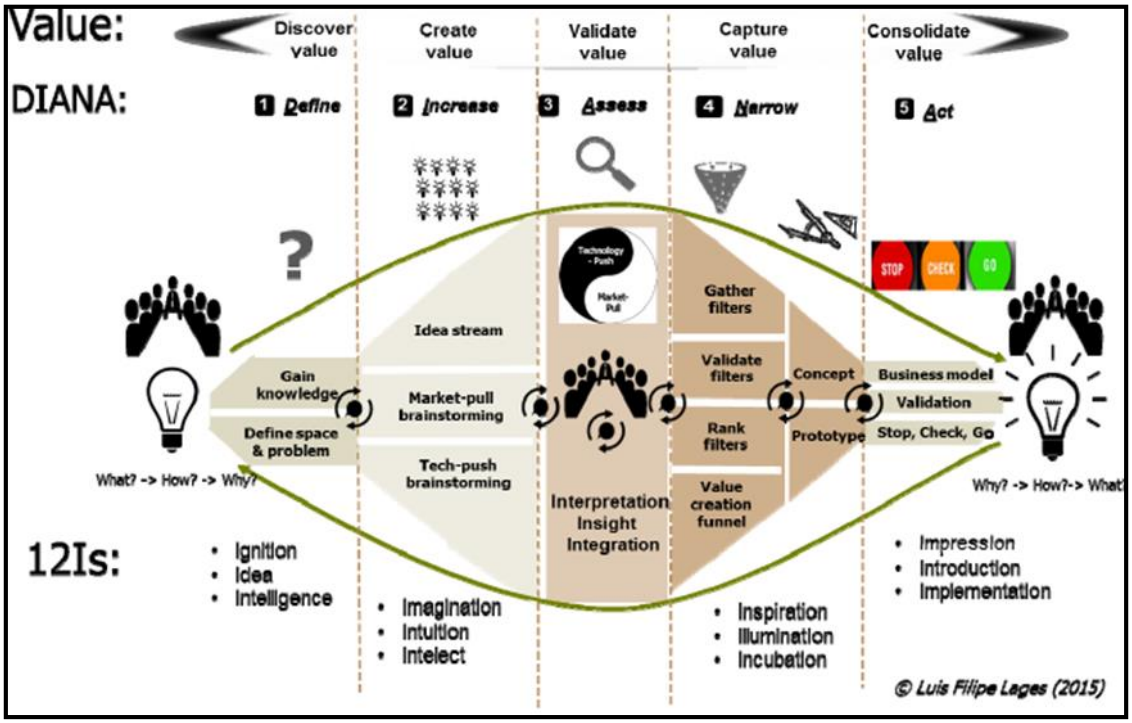
Source: DME

Exhibit 3 – DME's net profits (2007-2014), in thousands of euros



Source: Elecnor

Exhibit 4 – The Value Creation Radar[xvi]



Source: Lages, Luis Filipe. 2015

Exhibit 5 – Earth Observation – A Value Chain[xxi]

Note: This is the actual value chain. DME pretends to offer new solutions for the midstream section of the chain by selling not only data but also software development tools and by renting infrastructure.

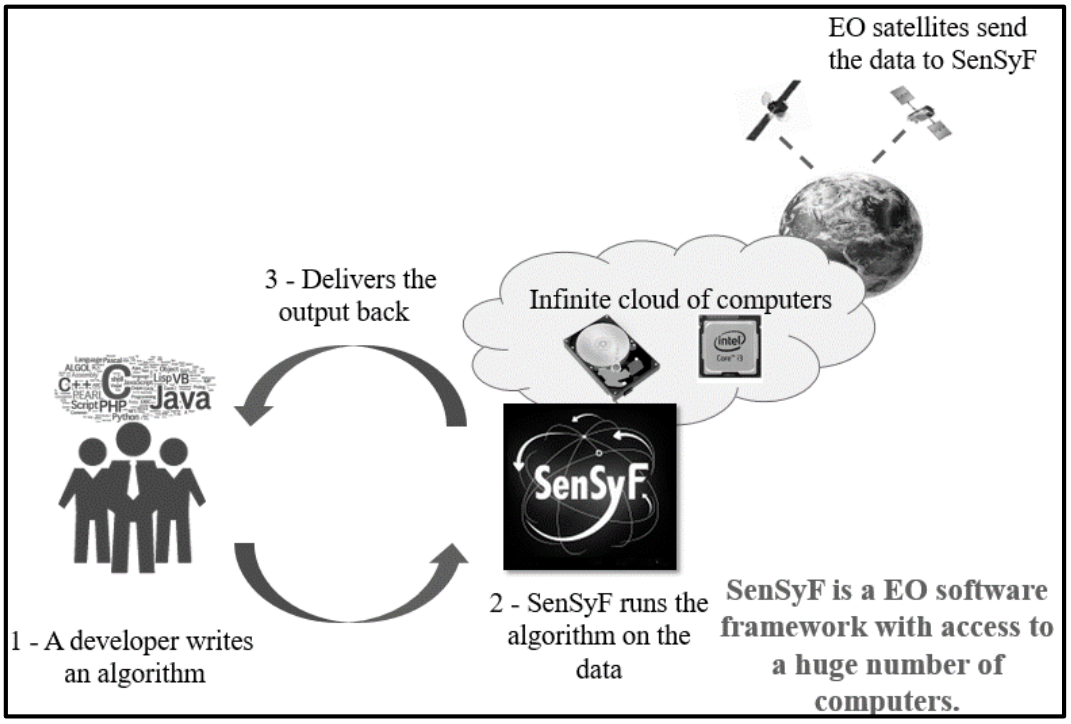
Upstream - Refers to the providers of EO Space infrastructure, comprising satellite and ground system manufacturers and operators, as well as the providers of launch capabilities.

Midstream - Refers to data providers, who make use of upstream infrastructure for commercial and institutional purposes. The core activities include the acquisition, production, processing, archiving and distribution of Space-derived data.

Downstream - Represents companies offering Value-Added Services (VAS). Such companies typically develop commercial applications based on EO data provided by the commercial data resellers.

Source: Space Tec Parners

Exhibit 6 – The functioning of SenSyF



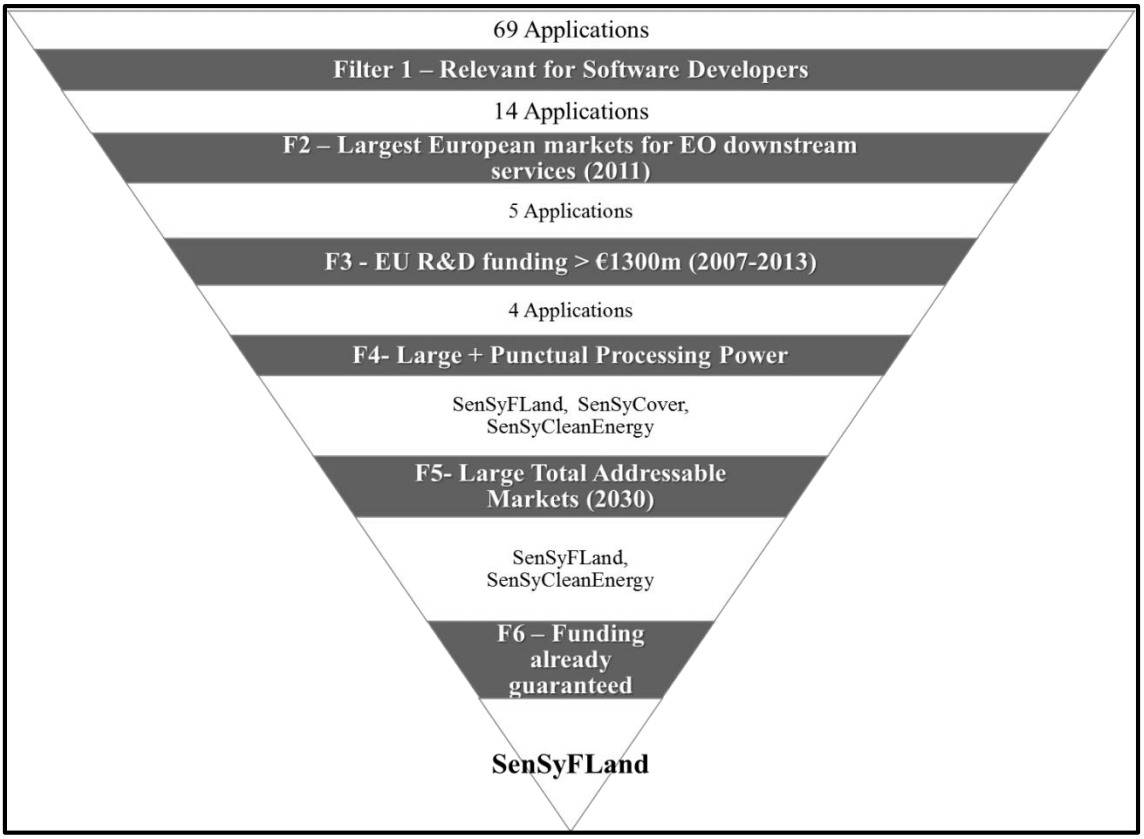
Source: Developed by the consultants

Exhibit 7 – Filters to which the stakeholders applied the Poker Methodology

Market and trends	Company, Technology and Team	Funding
High Market Growth	Relevant for developers	Development can be funded (H2020/ESA/EU)
Largest European Markets for EO downstream services	Sufficient People to develop it	Elecnor Business Unit would benefit from the application
Reduced number Of competitors	Alignment of application with company vision	
Low capital requirements to enter in the market	No need for suppliers	
Existing access to distribution channels	No need for further partnerships	
Low change costs	High output reliability	
High change costs	Easy to develop	
Inexistence of more efficient alternatives	Easy to implement	
High potential profit margins	Low time to market	
Easiness to gather market data	High technology readiness level	
No need for educating the market	Need to develop a large number of tools	
Potential customers are public	Scalability potential	
Wide range of targets	Supported by Sentinel Data	
Large customer base	No need for short revisit time	
Reduced customer base	No need for very high resolution images	
Potential customers are small	No need for data from other sources (e.g. meteorological models, in-situ)	
Low cost of market research	Difficult to copy	
We know customers	Patentable	
Well defined client community	Complies with DME's expertise	
Socially responsible	Requires DME to hire personnel	
Ethically accepted	Large and Punctual processing power	
	Legal to get the required data	
	Timeless requirements for data	
	Dependence on non-free data sources	
	The application can be used in other areas in the future	

Source: Developed by the consultants and by the SenSyF stakeholders

Exhibit 8 – The Value Creation Funnel applied to SenSyF[xxii]



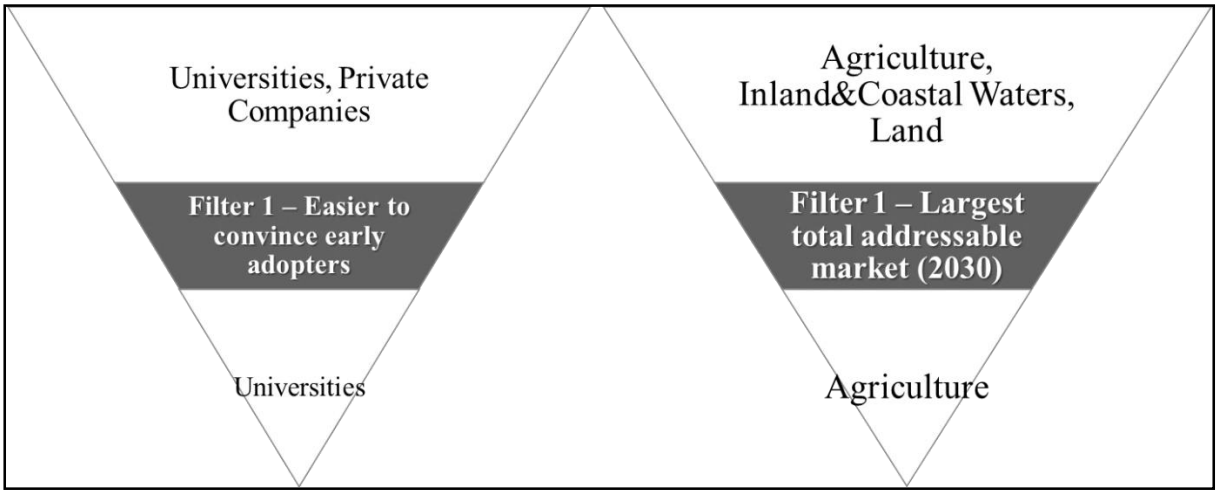
Source: Developed by the consultants[xxiii]

Exhibit 9 – Examples of value added services that can be built with SenSyFLand.

Agriculture	Land	Coast or Inland Waters
• Optimization of field inputs (water, fertiliser, pesticides) • Optimization of seed density • Deciding the crop type (based on type of soil) • Assessment of growing crop • Assessment of yield potential • Relative Chlorophyll maps • Forest vigour and health (fire insurance) • Crop insurance apps • Biomass Maps	• Urban Planning • Study land use (type of vegetation, soil parameters…) • Forest management (plan forest roads, assess fire impact…) • Measure effects of natural disasters	• Erosion impact on coast • Pollution • Quantity of Inland water • Measure conditions for practicing water sports (sail, surf, kitesurf…)

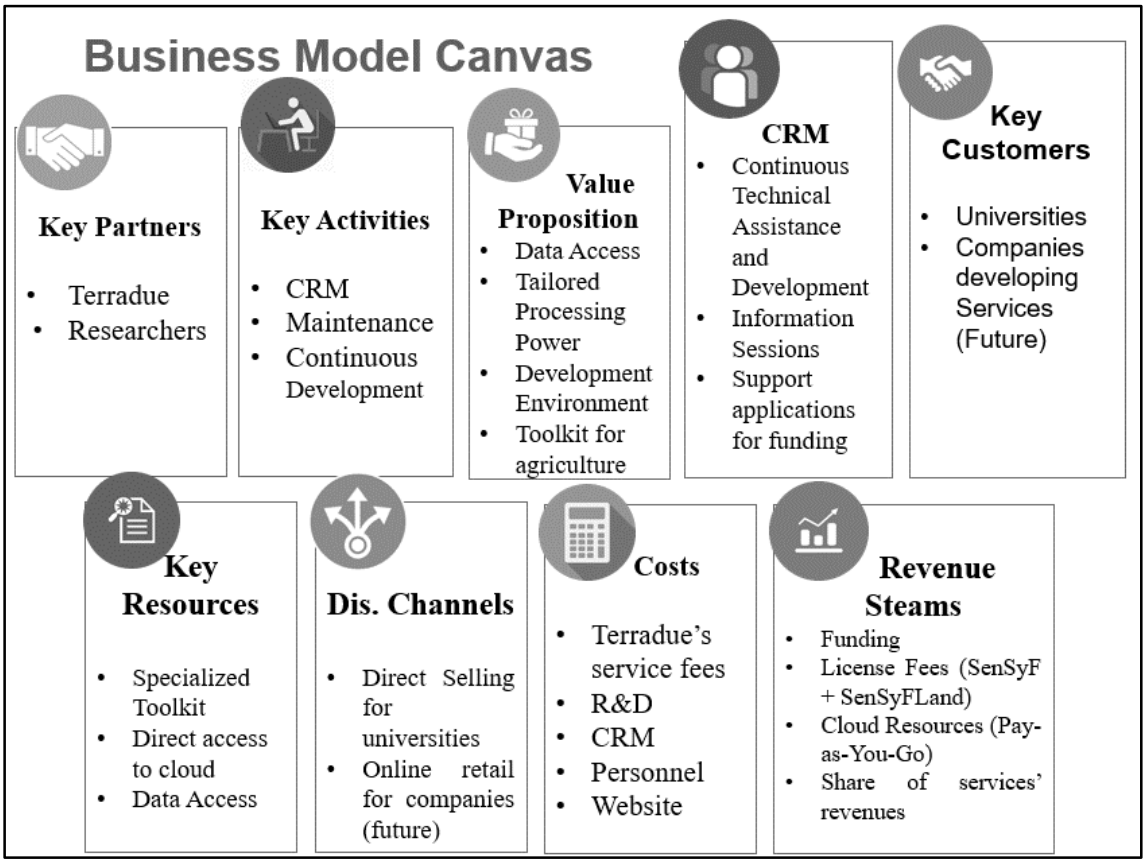
Source: Developed by the consultants

Exhibit 10 – Target selection. Left Funnel: type of customer; Right Funnel: Type of final service the customer will develop.[xxiv]



Source: Developed by the consultants

Exhibit 11 –Business Model Canvas for SenSyFLand



Source: Developed by the consultants and by the board of directors

Exhibit 12 – The 3 M's: Money, Men and Minute [xix]

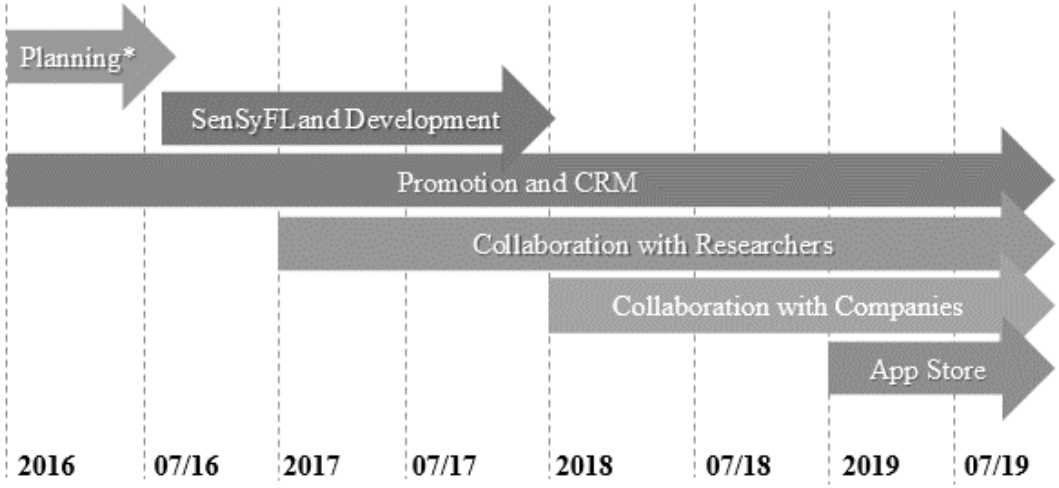
Money

- **Revenues to be estimated:** Full price licenses (for professional customers); Reduced price licenses (for students); Share of revenues from the applications developed with the reduced price licenses.
- **Costs to be estimated:** Research and Development; Customer Relationship Management; Personnel; Infrastructure (Website and Terradue's cloud).

Men

- **Product Manager |** Background: Technical and Management
  Tasks: Coordinates the implementation of the business model and manages the team.
- **Internal Developers |** Background: Engineering
  Tasks: Support external developers; Develop of tools and platform; Define tools to be built externally; Perform quality tests for tools developed externally.
- **External Developers** | Background: Technical (MSc. Or PhD candidates)
  Tasks: Develop tools ordered by DME as a MSc. or PhD final project
- **Marketing Specialist |** Background: Marketing or Management
  Tasks: Responsible for CRM, Promotion and Market Research.
- **Salesperson |** Background: Technical and with previous selling experience
  Tasks: Communicate with prospect customers and universities.

Minute



***Planning:** Defining which tools should be built by external developer; Measuring Potential Costs and Revenues.

Source: Filled by the consultants

Teaching Note

1- Case Description

This case illustrates the application of the Value Creation Radar (VCR) to SenSyF, a recently developed space technology by Deimos Engenharia S.A. (DME). It highlights the main challenges of bringing a technology-driven company closer to the market in the pursuit of long term sustainability, while not compromising its technological capabilities. Hence, the case study is designed to trigger discussion within Innovation Management, New Product Development, Marketing, Strategy and Change Management courses at the Masters, MBA and Executive levels.

The case opens with the description of the history, areas of expertise, resources and overall strategy of DME, a Portuguese space engineering company born in 2001. It explains how new European regulations defined that companies applying for funds under H2020 should be selected not only according to innovation but also to the market potential. This constituted a major problem for DME, as the firm always focused in pure research projects with no market potential and never had a management staff.

Then, a consultancy firm was hired to apply the Value Creation Radar (VCR), developed by Professor Luis Filipe Lages. The methodology has 5 major stages. The first was **Defining Value,** during which the consultants got to know the company, the market and the technology. Then, the case moves to **Generating Value**, in which the team obtained primary and secondary data in order to collect the market information and find out the maximum amount of potential market applications. In the **Analysing Value** stage, the team involved the company stakeholders in the validation process in order to assess the potential of each market application and present potential filters. On the fourth stage, **Creating Value**, the team applies the final filters, which led to the market application with the highest potential (SenSyFLand). This was then defined in terms of key attributes and market needs to be communicated in a new

positioning statement. On the last stage, **Capturing Value**, a new business model and a path to get to the market is presented.

The case ends with the board of directors in the presence of a dilemma: shall they opt for the risk of developing the purposed market application or to go for two short-term contracts which have been purposed by two potential clients to the consultants during the case study.

2- Teaching Objectives

Depending on the course in which this case study is taught, it will have different teaching objectives. Some of these are highlighted below:

- To understand how the Value Creation Radar is useful for a technology-driven company to overcome the Paradox of Choice within a limited timeframe and with restricted resources;
- To analyse how the cognitive conflict between two contrary forces – the market and the technology – can be useful in the development process of an innovation;
- To explore organizational issues that may affect companies in the process of shifting from a technology push strategy to a hybrid strategy comprising both technology-push and market-pull perspectives

3- Recommended Pre-Readings

- **Lages, Luis Filipe.** 2015, "How to grow, create and capture value in domestic and international markets", Nova SBE Working Paper, nr. 599
- **Schwartz, B.** 2004. “The paradox of choice: Why more is less.” January, New York: Ecco.

4- Discussion Questions

a) Which factors led the company to hire external consultants?

In this question, students should analyse DME's current situation and its position in the European space sector. They are organized as external, financial, and strategic factors.

External: The trend towards funding only projects with an expected relevant market value was affecting the space sector. The SenSyF project ended in 2015 and DME's representatives were concerned about DME's capability to meet the European Commission's new requirements for funding new projects.

Financial: The two consecutive years in the red – 2011 and 2012 – had seriously threatened the company's future. Despite feeling that a strategy shift was required, DME did not want to take a risk of hiring a whole market oriented team at once.

Strategic: Since DME's main objective is to be a research reference in the European space panorama, it always pursued new knowledge rather than exploiting the existent technologies. Due to this, no service or product was ever commercialized and so DME never hired market-oriented employees. With the threating financial condition and the new European directives, DME needed to obtain external and unbiased advice to exploit SenSyF.

b) Why was the VCR useful for the consultants? And for DME?

For both: The VCR taught how cognitive conflict between the market and the technology – two contrary forces – can be balanced. Both of the parts learned how to engage in a constant feedback exchange in order to transform raw technologies into valuable products or services.

For the consultants: The VCR was convenient to learn about the past and the present of the company and to consistently pursuit new market applications. By following the methodology, the consultants could understand which data should be gathered in order to quickly learn DME's history, organizational structure and core business. Moreover, it clarified the current European space market dynamics and expected future.

For DME**:** The framework was useful to plan for the future. Since the company did not sell any service, attracting private investment was not an option. Hence, DME was in need to develop a new project with commercial value for the European Commission. DME had to find a way to scan the market. The VCR allowed DME, a company with a bias towards the technology, to learn about how to find potential market applications. Moreover, the VCR supported the participants to overcome the Paradox of Choice and select the "right market" to invest through the consultants' study for external and unbiased information. At the end, DME received a suggestion for a business model canvas and a path (3 M's Framework) to get there.

c) How helpful is the VCR exploit potential synergies between the market-pull and the technology-push?

Business schools tend to teach students how to apply a market-oriented reasoning in order to address proven market needs, while disregarding science and technology as key concepts for innovation management. On the contrary, technical universities focus on building solid scientific and mathematical thinking that do not necessarily respond to market needs. This leads future managers to be poorly prepared for the professional life, since being able to brainstorm with people from different backgrounds is crucial for innovation. The VCR is useful for business students or young professionals that work for technological companies like DME. In this case, the inexistence of business-oriented people led the company to be concerned with technicalities for over 10 years instead of concentrating in growth opportunities. The company became dependent on public funding and its negative results in 2012/2013 hinted the need for revenue diversification. In order to achieve success, technological firms should hire background-diverse professionals and start to encourage constant brainstorming sessions. Otherwise, if there is a need to find a business solution, business-oriented and technology-oriented teams are likely to propose very different alternatives that are biased and seldom complementary.

The VCR supports current and future managers to systematically brainstorm with peers and external individuals in order to adopt market-pull and technology-push mind-sets. This way, companies can find out new market applications for services and products that are technically feasible and have high market potential. In other words, the VCR incentivizes knowledge exchange among different areas of expertise and increases the chances of innovating.

d) What should the company do?

Option A – Developing SenSyFLand

- Pros: This option would allow DME to diversify its sources of revenue. Moreover, SenSyFLand is considered a project with market value and therefore further project developments could also be funded under the H2020 program.
- Cons: Requires the company to build a communication strategy in order to educate the market for a new service. Furthermore, it would clearly be necessary hire new senior market-oriented professionals since the company had no capacity to train them. There are no estimates of cost structure nor revenues.

Option B – Signing the two contracts

- Pros: It complies with DME's strengths and would provide a safe cash flow in 2016. The SenSyF developers would be allocated to this project and there will be no need to hire personnel. New partnerships with national authorities could be established.
- Cons: It is only sustainable in the short run and has no market focus.

(Suggestion) Hybrid solution: DME could accept option B while hiring a business analyst to conduct a deeper analysis of option A. At the end of the short-run contracts, DME will have already prepared cost and revenue estimates and will have conducted a deep market scan. This allows the company to become dynamic by exploiting the current opportunities while tracking for growth opportunities.

Endnotes

[i]**Elecnor Deimos**. "About Us", Available from http://www.deimos-space.com/en/elecnordeimos/ Accessed 10 September, 2015.

[ii]**ESA**. "What is ESA?", from http://www.esa.int/About_Us/Welcome_to_ESA/What_is_ESA. Accessed 10 December, 2015.

[iii]**European Commission.** 2014. "General Annexes – H. Evaluation.", in *Horizon 2020 – Work Programme 2014-2015*, Available from http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-h-esacrit_en.pdf Accessed 12 September, 2015.

[iv]**Copernicus**. "Project Database – SenSyF", from http://www.copernicus.eu/projects/sensyf. Accessed 6, September 2015.

[v]**Schwartz, B.** 2004. "The paradox of choice: Why more is less." January, New York: Ecco.

[vi] DME; Later confirmed by Joel Silva, an ESA researcher.

[vii]Copernicus was called Global Monitoring for Environment and Security until 2012.

[viii]**Euroconsult.** 2012, "Satellite-Based Earth Observation, Market Prospects to 2021",116

[ix]**European Commission.** 2013. "Copernicus: The EU Earth Observation Programme - good for jobs and the environment!", Available from http://www.wired-

gov.net/wg/news.nsf/articles/Big+Data+is+Big+Business+16042014092500?open. Accessed 20 November, 2015.

[x] Source: **Wiredgov**. "Big Data is Big Business", Available from http://www.wired-gov.net/wg/news.nsf/articles/Big+Data+is+Big+Business+16042014092500?open. Accessed 20 November, 2015.

[xi]Consortium: DEIMOS Engenharia S.A. (Portugal), DEIMOS Space (Spain), Terradue SRL (Italy), Centro Nacional de Información Geográfica (Spain), ACRI-ST SAS (France), Northern Research Institute Tromsø AS (Norway), ARGANS Limited (United Kingdom), Instituto Superior Técnico (Portugal) and Universitat de Valencia (Spain).

[xii] **Copernicus**. "Copernicus in brief" Available from http://www.copernicus.eu/main/copernicus-brief. Assessed 21 December, 2015

[xiii]**Euroconsult.** 2014, "Brochure - Satellite-Based Earth Observation, Market Prospects to 2023*"*, 5

[xiv]**Northern Sky Research.** 2012. "Global Satellite-Based Earth Observation, 4th edition – Report Briefing", 5, Available from http://www.nsr.com/upload/research_reports/NSR_EO4_Brief.pdf. Accessed 17 October, 2015.

[xv]**Space Tec Parners.** 2012. "Assessing the Economic Value of Copernicus: "European Earth Observation and Copernicus Downstream Services Market Study" (Executive Summary) – 4, Available from

http://www.copernicus.eu/sites/default/files/library/GMES_GIO_LOT3_PublishableExecutiveSummary_final.pdf. Accessed September 22, 2015.

[xvi]**ESA**. "ESA selects themes for EO Thematic Exploitation Platforms", Available from https://earth.esa.int/web/guest/-/esa-selects-themes-for-eo-thematic-exploitation-platforms. Accessed 9 October, 2015.

[xvii]The potential customers interviewed were Ana Fonseca (Head of the Applied Geodesy Unit at Laboratório Nacional de Engenharia Cívil), Mário Caetano (Principal Researcher at Direção Geral do Território), Joel Silva (Researcher at ESA), Marta Oliveira (PhD student in Public Health), Francisco Fonseca (Ecology professor at FCUL) and Helena Paulino (MSc. Student in Agronomic Engineering).

[xviii]**Lages, Luis Filipe.** 2015, "How to grow, create and capture value in domestic and international markets", Nova SBE Working Paper, nr. 599

[xix]**Smith, P.; Taylor, J.** 2004, "Marketing Communications: An Integrated Approach". 26-27. London: Kogan Page

[xx]**European Commission.** 2014, "HORIZON 2020 – WORK PROGRAMME 2014-2015, General Annexes: H. Evaluation", 2-3, Available from: http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-h-esacrit_en.pdf. Accessed 10 September, 2015.

[xxi]**Space Tec Parners.** 2012, "Assessing the Economic Value of Copernicus: European Earth Observation and Copernicus Downstream Services Market Study *(*Executive Summary*)"* – 4,

Available from: http://www.copernicus.eu/sites/default/files/library/GMES_GIO_LOT3_PublishableExecutiveSummary_final.pdf. Accessed 22 September, 2015.

[xxii] The sources of the filters used in the Value Creation Funnel are described below:

- **Filter 1 – Relevant for software developers**

  In this specific case, the filter was chosen and applied by the SenSyF stakeholders involved in the process. Only the applications for the midstream users passed through this filter.

- **Filter 2 - 5 largest European EO markets of EO downstream services (2011)**

  Space.TecPartners. 2012, "European Earth Observation and Copernicus Downstream Services Market Study"

- **Filter 3 - EU R&D funding > €1300m (2007-2013)**

  European Commission. 2014, "FP7 Research and Innovation – Budget 2007-2013". Available from: https://ec.europa.eu/research/fp7/index_en.cfm?pg=budget Accessed on 10 December, 2015

- **Filter 4 – Large and punctual processing power**

  In this specific case, the filter was chosen by the SenSyF stakeholders involved in the process. For the question "How often does each application typically require large and punctual processing power?", Nuno Catarino classified each application by attributing a number in the range from 1 (never) to 5 (very often). Since the SenSyF rents the infrastructure, the best market applications will need large punctual power during short periods of time.

- **Filter 5 – 5 largest Total Addressable Markets by 2030**

Space.TecPartners. 2012, "European Earth Observation and Copernicus Downstream Services Market Study"

- **Filter 6 – Funding already guaranteed**

  In this specific case, the filter was chosen by the SenSyF stakeholders involved in the process. For the question "Does DME have already guaranteed a fund with which the company can develop the next market applications?", Nuno Catarino replied Yes or No.

[xxiv] The sources of the filters used in the funnels are described below:

- **Left funnel – Filter 1** – **Easier to convince early adopters –** This filter was applied internally with the SenSyF stakeholders, which observed that the company had no resources to develop the whole service without external support. This way, the company decided that it was better to offer a "beta service" at a reduced price, while asking for collaboration in its development. At the same time, the company could incentivize users to try the service.
- **Right funnel – Filter 1 – Largest Total Addressable Markets (2030)**

  Space.TecPartners. 2012, "European Earth Observation and Copernicus Downstream Services Market Study"